
CATALOG AND LITERATURE GUIDE FOR CRETACEOUS AND CENOZOIC VASCULAR PLANTS OF THE NEW WORLD¹

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There is need for a source of information in electronic form on fossil plants for purposes of systematics, biogeography, paleobotany, and paleoecology. The principal impediment to such projects has been experience with past efforts that proved too complex to sustain given the resources available (e.g., The International Organization of Palaeobotany's [IOP] Plant Fossil Record, <<http://www.uk-bap.org.uk>>, later <<http://www.paleobotany.org>>; Boulter et al., 1991, Holmes, 1991). A number of new electronic catalogs are coming online that deal with subsets of the broader information field such as the holdings of an institution focused on particular geographic regions (the Paleobotany Project of the Denver Museum of Nature and Science; <<http://paleobotanyproject.org>>), woods (<<http://insidewood.lib.ncsu.edu>>), pollen and spores (PalDat, the palynological database (<<http://www.palдат.org>>), or Cenozoic angiosperms (the developing Cenozoic Angiosperm Database within the Paleobiology Database, <<http://www.paleodb.org>>). The latter will attempt to compile fossil records for all organisms, for all time, and for all places. Numerous other institutions are placing images of fossil specimens online, and the National Science Foundation is encouraging these efforts in the United States through the program for Advancing Digitization of Biological Collections (ADBC). It is clear that until these mega projects are sufficiently well advanced to provide relatively complete records, there is need for subsets of data with different emphasis that can be consulted.

The catalog announced here (<<http://www.mobot.org/mobot/research/CatalogFossil/catalog.shtml>>) focuses on the plant fossil record as a guide to information on evolution and co-evolutionary processes, calibrating phylogenies, detecting biogeographic patterns, and reconstructing paleoenvironments. It includes the name of the fossil and its family assignment according to the Angiosperm Phylogeny Group (2009) classification, or if a form name is used, the biological affinities as cited by the author (if no affinity is cited at least to the level of

family, the record is not included). In addition, the plant part or evidence on which the identification was made (including biochemical fossils and spectral patterns if derivation is cited to genus or family), age, locality, literature reference, and remarks are listed.

Traditional nonelectronic sources currently exist, and although mostly out-of-date, they can be consulted as an initial guide to early reports and literature until other catalogs become more complete. These are Andrews (1970; with supplements by Blazer, 1975, and Watt, 1982), LaMotte (1952), Muller (1981), Archangelsky et al. (2000, et seq.), Germeraad et al. (1968), and Graham (1973, 1979, 1982, 1986, 1999, 2010: app. 1, 2).

Examples from the catalog are presented below for the ferns, gymnosperms, and angiosperms.

FILICINEAE

†*Conatiopteris schumanii* (Cyatheaceae): Lower Cretaceous (Aptian), upper Chickabally Member, Budden Canyon Formation, near Cottonwood, California, U.S.A., trunk, frond bases, adventitious roots; Lantz et al., 1999: 361: [Cladistic analyses “indicate that the new genus is nested among a paraphyletic assemblage of dicksoniaceae, lophorosiaceae, and metaxylaceae species that subtend a monophyletic Cyathaceae s.s.”]

†*Kuylisporites* (†*K. mirabilis*, †*K. separatus*, †*K. scutatus*, †*K. waterbolkii*; Cyatheaceae): Cretaceous, Cenozoic, widespread, spores; Mohr & Lazarus, 1994: 765: [“... genus originated in the Northern Hemisphere in the late Cretaceous; *K. waterbolkii* ... closely related to or identical with extant *Cnemidaria*.”]

GYMNOSPERMAE

Chamaecyparis Spach sp. (Cupressaceae): Middle Eocene, Thunder Mountain flora, central ID, vegetative axes; Erwin & Schorn, 2005: 125: [“Radiometrically dated at 46–45 Ma, it represents one of the

¹ Visit the catalog at <<http://www.mobot.org/mobot/research/CatalogFossil/catalog.shtml>>.

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oldest montane conifer-dominated assemblages recovered from the Northern Hemisphere.”]

Podocarpus L'Hér ex Pers. (Podocarpaceae): Eocene, western Tennessee, leafy shoots; Dilcher, 1969. *Podocarpus matudae* Lundell: (modern, as a possible pre-Quaternary relict), two plastid DNA markers suggest that a divergence time between the unique haplotypes from a Guatemalan population and the two most common haplotypes from the Sierra Madre Oriental in Mexico was between 10 and 20 Ma, and further haplotype divergence in the poorly resolved clade of the Sierra Madre Oriental occurred between 3 and 0.5 Ma; findings support a Miocene age for temperate floristic elements in Mesoamericana cloud forest, whereas further haplotype divergence within the Sierra Madre Oriental, Chiapas, and Guatemala occurred more recently, coinciding with Pleistocene cloud forest refugia (Ornelas et al., 2010).

ANGIOSPERMAE

Acer L. (Aceraceae): Based on up to seven chloroplast loci, “the nine North American species of *Acer* diverged from their nearest relatives at widely different times; eastern American *Acer* diverged in the Oligocene and Late Miocene; western American species in the Late Eocene and Mid Miocene; and the *Acer* core clade, including *A. saccharum*, dates to the Miocene” (Renner et al., 2008: 795). “The oldest described *Acer* fossils are Paleocene fruits from North America and Eurasia (Wolfe & Tanai, 1987; Crane et al., 1990; Manchester, 1999; Kittle et al., 2005), but still older fruits from the Maastrichtian (66.5 Ma) Hell Creek formation in South Dakota also conform morphologically to *Acer* (K. R. Johnson, pers. comm. to Renner, August 2008). “None of these ancient isolated fruits, however, can securely be assigned to an extant clade” (Renner et al., 2008: 798).

Guatteria Ruiz & Pav. (Annonaceae): Erkens et al. (2007: 399) infer four plastid regions (*matK*, *rbcl*, *trnL-trnF*, *psaA-trnH*) and “three major biogeographical events in the history of the genus: (1) a transoceanic Miocene migration from Central into South America before the closing of the Isthmus of Panama; (2) a major diversification of the lineage within South America; and (3) several migrations of South American lineages back into Central America via the closed Panamanian land bridge. Therefore, *Guatteria* is not an Amazonian centered-genus sensu Gentry but a major Miocene diversification that followed its dispersal into South America.” The authors noted (p. 404) that there are no known fossils of the genus, but in addition to *Guatteria*-like phytoliths reported from the Quaternary of Central America, macrofossils (†*G. culebrensis*) are reported

from the Miocene of Panama and Peru (unverified; for additional reports of Annonaceae and for references, see Graham, 2010: app. 2.2, 588).

New versions will be placed online about every six months, and additions and corrections are invited.

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